

WHAT IS CLAIMED IS:

- 1 1. A cathode material comprising an irreversible high capacity material and a
2 reversible low capacity material.
- 1 2. The cathode material of claim 1, wherein the reversible low capacity material
2 includes a lithiated manganese dioxide.
- 1 3. The cathode material of claim 1, wherein the irreversible high capacity
2 material includes a carbon fluoride.
- 1 4. The cathode material of claim 2, wherein the irreversible high capacity
2 material includes a carbon fluoride.
- 1 5. The cathode material of claim 4, wherein the lithiated manganese dioxide and
2 the carbon fluoride are blended.
- 1 6. The cathode material of claim 4, wherein the lithiated manganese dioxide
2 includes an electrolytic manganese dioxide or a chemical manganese dioxide.
- 1 7. The cathode material of claim 4, wherein the carbon fluoride is CF_x .
- 1 8. The cathode material of claim 4, wherein the lithiated manganese dioxide and
2 the carbon fluoride are present in a ratio in the range of 1:99 to 99:1 by weight.
- 1 9. The cathode material of claim 4, wherein the lithiated manganese dioxide and
2 the carbon fluoride are present in a ratio in the range of 5:95 to 95:5 by weight.
- 1 10. The cathode material of claim 4, wherein the lithiated manganese dioxide and
2 the carbon fluoride are present in a ratio in the range of 25:75 to 75:25 by weight.
- 1 11. The cathode material of claim 4, wherein the lithiated manganese dioxide and
2 the carbon fluoride are present in a ratio in the range of 20:80 to 80:20 by weight.

1 12. The cathode material of claim 2, wherein the lithiated manganese dioxide
2 includes a low surface area lithiated manganese dioxide.

1 13. The cathode material of claim 11, wherein the low surface area lithiated
2 manganese dioxide has a specific surface area of between 0.50 and 20.0 m²/g.

1 14. The cathode material of claim 11, wherein the low surface area lithiated
2 manganese dioxide has a specific surface area of between 10.0 and 15.0 m²/g.

1 15. A cathode material comprising a low surface area lithiated manganese
2 dioxide.

1 16. The cathode material of claim 14, wherein the low surface area lithiated
2 manganese dioxide has a specific surface area of between 0.50 and 20.0 m²/g.

1 17. The cathode material of claim 14, wherein the low surface area lithiated
2 manganese dioxide has a specific surface area of between 10.0 and 15.0 m²/g.

1 18. The cathode material of claim 14, wherein the low surface area lithiated
2 manganese dioxide, when mixed with an electrolyte including an organic solvent and a
3 lithium salt, produces a gas pressure of no more than 16 PSI after 100 hours at 70 °C.

1 19. A primary lithium battery comprising:
2 a cathode including an irreversible high capacity material and a reversible low capacity
3 material;
4 an anode including lithium; and
5 a separator between the cathode and the anode.

1 20. The battery of claim 18, wherein the reversible low capacity material includes
2 a lithiated manganese dioxide.

1 21. The battery of claim 19, wherein the lithiated manganese dioxide includes an
2 electrolytic manganese dioxide or a chemical manganese dioxide.

1 22. The battery of claim 19, wherein the battery delivers a capacity at least 40%
2 greater than the sum of the expected capacities of the lithiated manganese dioxide and the
3 irreversible high capacity material under high drain conditions.

1 23. The battery of claim 18, wherein the irreversible high capacity material
2 includes a carbon fluoride.

1 24. The battery of claim 19, wherein the irreversible high capacity material
2 includes a carbon fluoride.

1 25. The battery of claim 23, wherein the lithiated manganese dioxide and the
2 carbon fluoride are blended.

1 26. The battery of claim 23, wherein the carbon fluoride is CF_x .

1 27. The battery of claim 23, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 1:99 to 99:1 by weight.

1 28. The battery of claim 23, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 5:95 to 95:5 by weight.

1 29. The battery of claim 23, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 25:75 to 75:25 by weight.

1 30. The battery of claim 23, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 20:80 to 80:20 by weight.

1 31. The battery of claim 23, further comprising an electrolyte including an organic
2 solvent.

1 32. The battery of claim 23, wherein the lithiated manganese dioxide includes a
2 low surface area lithiated manganese dioxide.

1 33. The battery of claim 30, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 0.50 and 20.0 m²/g.

1 34. The battery of claim 30, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 10.0 and 15.0 m²/g.

1 35. The battery of claim 30, wherein the low surface area lithiated manganese
2 dioxide, when mixed with an electrolyte including an organic solvent and a lithium salt,
3 produces a gas pressure of no more than 16 PSI after 100 hours at 70 °C.

1 36. The battery of claim 30, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 1:99 to 99:1 by weight.

1 37. The battery of claim 30, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 5:95 to 95:5 by weight.

1 38. The battery of claim 30, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 25:75 to 75:25 by weight.

1 39. The battery of claim 30, wherein the lithiated manganese dioxide and the
2 carbon fluoride are present in a ratio in the range of 20:80 to 80:20 by weight.

1 40. The battery of claim 30, further comprising an electrolyte including an organic
2 solvent.

1 41. A primary lithium battery comprising:
2 a cathode including a low surface area lithiated manganese dioxide;
3 an anode including lithium; and
4 a separator between the cathode and the anode.

1 42. The battery of claim 38, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 0.50 and 20.0 m²/g.

1 43. The battery of claim 38, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 10.0 and 15.0 m²/g.

1 44. The battery of claim 38, further comprising an electrolyte including an organic
2 solvent.

1 45. The battery of claim 38, wherein the low surface area lithiated manganese
2 dioxide, when mixed with an electrolyte including an organic solvent and a lithium salt,
3 produces a gas pressure of no more than 16 PSI after 100 hours at 70 °C.

1 46. A method of manufacturing a cathode active material comprising combining
2 an irreversible high capacity material and a reversible low capacity material.

1 47. The method of claim 43, wherein the reversible low capacity material includes
2 a lithiated manganese dioxide.

1 48. The method of claim 43, wherein the irreversible high capacity material
2 includes a carbon fluoride.

1 49. The method of claim 44, wherein the irreversible high capacity material
2 includes a carbon fluoride.

1 50. A method of manufacturing a primary battery comprising combining a
2 lithiated manganese dioxide and a carbon fluoride to form a cathode material.

1 51. The method of claim 47, wherein the carbon fluoride is CF_x.

1 52. The method of claim 47, further comprising forming a cathode including the
2 cathode material.

1 53. The method of claim 49, further comprising assembling the cathode with an
2 anode including lithium in a housing.

1 54. The method of claim 50, further comprising assembling the cathode with an
2 electrolyte including an organic solvent in the housing.

1 55. The method of claim 47, wherein the lithiated manganese dioxide includes a
2 low surface area lithiated manganese dioxide.

1 56. The method of claim 52, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 0.50 and 20.0 m²/g.

1 57. The method of claim 52, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 10.0 and 15.0 m²/g.

1 58. A method of manufacturing a primary battery comprising forming a cathode
2 material including a low surface area lithiated manganese dioxide.

1 59. The method of claim 55, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 0.50 and 20.0 m²/g.

1 60. The method of claim 55, wherein the low surface area lithiated manganese
2 dioxide has a specific surface area between 10.0 and 15.0 m²/g.